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ABSTRACT

This paper reviews the work environment surrounding integrated office systems, synthesizes the known effects of automated office technologies, and discusses their impact on work efficiency in office environments. Particular attention is given to the effect of automated technologies on networks, workflow/processes, and organizational structure and power. Emphasis is given to structural changes due to the introduction of newer information technologies in organizations, especially the impact upon the average organization's middle ranks, which have shrunk drastically with the adoption of new methods of communication and information processing. Research projects are listed by author(s) and date together with a brief statement of the work efficiency impacts found by each study, and conclusions suggest that organizations do not achieve and maintain effectiveness by technology alone. It is recommended that integrated information technology be applied creatively to change the way organizations carry out their activities and use technology to their own competitive advantage. A list of references completes the document. (JB)

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INTEGRATED COMMUNICATIONS AND WORK EFFICIENCY:
IMPACTS ON ORGANIZATIONAL STRUCTURE AND POWER*

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INTEGRATED COMMUNICATIONS AND WORK EFFICIENCY:
IMPACTS ON ORGANIZATIONAL STRUCTURE AND POWER

Abstract

It is fairly recent since organizations have begun to view office automation efforts in a comprehensive context instead of in terms of individual devices. Organizations have hardly tapped five percent of the possibilities utilizing integrated communication technologies in office settings. Consequently, the integrated automated office is fast becoming a reality. At stake for organizations is an opportunity to speed up communications, reduce paper flow and achieve productivity gains throughout the entire organization. It is quite obvious that only by integrating various office automation devices into one coordinated system--an "orchestrated" system--will the office of today be truly efficient and effective. A well-planned, integrated office automation system demonstrates five characteristics:

1. It incorporates executives, managers and secretaries.
2. It transmits reliably fully integrated electronic documents --text, data, voice, as well as pictures--and stores them electronically across systems at high speeds, be it local or otherwise.
3. It is a host-based system designed around a central computer and a common architecture. As a consequence, end-users can gain easy access to common data bases, edit documents and transfer them between similar and dissimilar devices, including equipment from different manufacturers.
4. It is a real-time management information system, giving its users access to all information in the organization and enables them to transmit information to their colleagues, wherever they may be.
5. It has flexible configurations, an open architecture, transparent connectivity, compatibility, intelligence, full-functional capability and, when appropriate, desktop functionality.

Within just the last two years, a number of products have become available on the market that in toto seem to make the integrated office come true: local area networks, personal computers, digitized PBXs, voice mail systems, sophisticated word processors, digitized facsimile, computers that communicate, as well as the emergence of private and public networks.

Currently, it seems that the growing sophistication of networks is the most important element that will make the integrated office a reality. Such networks have become the necessary enabler without which few of the real benefits of the integrated office can be achieved.

The needed technology exists today, although refinements are necessary in such areas as voice recognition and in developing strategies to tie the individual elements of the system together.

An integrated office system, however, is more than just the sum of its parts. Specifically, it is the applications that matter most, not the devices. In this sense then an integrated office system is not defined by its hardware, but by its software. This software, in turn, allows dissimilar devices to communicate among each other and makes the entire system easy to use. There appears to be a growing recognition that the management of information and effective communication are as important, if not more so, to organizational success as are products and services.

In this contribution the author reviews the work environment surrounding integrated office systems. He synthesizes the known effects of automated office technologies and reviews their known impact on work efficiency in office environments. These effects are explored with regard to their impact on networks, work flow/processes, as well as organizational structure and power. Particular emphasis is given to structural changes due to the introduction of newer information technologies in organizations, i. e. during the last few years it could be observed that the function of middle management has changed and the technology is rapidly reorganizing the work people do. The new information technologies have restructured the average organization's middle ranks and, as a consequence, they have shrunk drastically. Organizational pyramids have flattened with fewer levels since executives have realized that they can get ahold of the needed information via the new technologies quicker and directly and do not have to rely on middle-level managers.

The author stresses the point that power shifts are typically accompanied with these technologies resulting in the generation of a new form of organizational power. - These effects and trends can be seen as an evolutionary step toward more flexible, decentralized and less defined organizational structures, resulting in a fluid organizational structure whose design is based on the changing needs of the organization.

1. Introduction

Office automation conjures images of legions of secretaries typing away in front of video display terminals. But the term implies no longer just word processing. Instead it is conceived today as a web of new technologies, including computers, PBXs, voice mail, electronic messaging, facsimile devices, conferencing systems, and others. The new information technologies affect the access to and then flow and distribution of information throughout an organization and, eventually, the resulting changes can lead to drastic changes in the organizational structure itself.

It is fairly recent that organizations have begun to view office automation efforts in a comprehensive context instead of in terms of individual technologies. Although approximately 87 percent of 89 companies in nine countries stated that computerized information flows play a very important role in at least one corporate activity and even though the extent of computerized information use is expected to rise to 92 percent by 1988 (Spero, 1983, p. 67), several authors (e. g., McArthur, 1984, p. 57; Vernon, 1984) claim that organizations have hardly tapped five percent of the possibilities utilizing integrated information technologies in office settings. At stake for organizations is an opportunity to speed up communications, reduce paper flow and achieve productivity gains throughout the entire organization. Consequently, the integrated automated office is fast becoming a reality. It is quite obvious that only by integrating various office automation technologies into one coordinated system--an orchestrated system--will today's office be truly efficient and effective. There are three broad classes of integration that can be identified: (a) the integration of information, (b) the integration of user interfaces, and (c) the integration across systems.

A well-planned, integrated office automation system demonstrates five characteristics:

1. It incorporates executives, managers, and support staff.
2. It transmits reliably fully integrated electronic documents--text, data, voice, as well as pictures--and stores them electronically across systems at high speeds, be it local or otherwise.
3. It is a host-based system designed around a central com-

puter and a common architecture. As a consequence, end-users can gain easy access to common data bases, edit documents and transfer them between similar and dissimilar devices, including equipment from different manufacturers.

4. It is a real-time management information system, giving its users access to all information in the organization and enables them to transmit information to their colleagues, wherever they may be.
5. It has flexible configurations, an open architecture, transparent connectivity, compatibility, intelligence, full-functional capability and, when appropriate, desktop functionality.

Within just the last two years, a number of technologies have become available on the market that in toto seem to make the integrated office come true. They range from voice mail systems via local area networks to integrated communication satellite services. It seems that the growing sophistication of networks is currently the most important element that will make the integrated office a reality. Without such networks few of the real benefits of the integrated office can be realized.

Much of the needed technology exists today, although refinements are necessary to tie the individual elements of the automated system together. An integrated office system is more than just the sum of its parts and it is specifically the applications that matter most, not the devices. Planners and users alike must learn to understand that they are not a single-cell unit, but that they are part of an interdependent community. In this sense then an integrated office system is not defined by its hardware, but by its software. This software in turn should allow dissimilar devices to communicate among each other and make the system easy to use. In accordance with this line of thinking, there appears to be a growing recognition that the management of information and effective communication are as important, if not more so, to organizational success as are products and services.

2. The Work Environment Surrounding Integrated Office Systems

One can identify three classifications of office workers as prospective

users of an integrated office system: (1) those making limited transactions account for 33 percent of the workforce, (2) full-function professionals amount to 27 percent, and (3) specialized professionals constitute five percent of the workforce. The remaining 35 percent are white-collar workers who are not potential system users due to the specialized nature of their organizational activities (Vernon, 1984, p. 28). In 1983 there were 53 million white-collar workers in the United States and 35 million were potential users of integrated offices systems, but less than five million had only desktop devices available to them (Vernon, 1984, p. 28). Even today truly integrated desktop systems have enjoyed very little penetration in most organizations, a shortcoming that is likely to change rather drastically with the massive advent of personal computers on workers' desktops. One must consider, however, that while striving towards automated integration, such desktop devices must be linked at least via a local area network and ideally linked with a central mainframe computer in larger organizational settings. Within this environment office systems are moving toward the integration of any function that can be carried out by a number of technologies.

The market for telecommunications equipment and services in the United States is certainly a most promising one. It is expected to reach \$150 billion annually by 1987, a 50 percent increase over current spending ("Memo," 1984, p. 22). Sales of communications technology hardware alone has reached \$60 billion in 1983 according to Arthur D. Little estimates and will increase to \$90 billion annually by 1988 ("What next," 1984, p. 59). Information processing has also grown into an enormous industry, accounting for \$33 billion in services in 1983—the last year for which figures are available—and it is projected to account for \$88 billion in 1988 (Lewis, 1985, p. 57). Office automation—according to some estimates—has reached only a small segment of the 14 million U. S. businesses with revenues less than \$10 million ("Office Automation," 1984, p. 126). Office costs have been estimated to increase at a compounded annual growth rate of 15 percent (Astin, 1984, p. 26).

Such market potential is also reflected in the various activities which typically can benefit from the use of communications equipment. For example, Xerox reports that in 1981 a total of 850 billion pages of business documents were produced in the United States compared to an anticipated 1.4 trillion pages in 1985 ("Surviving the Paper Tide," no date). This latter figure is expected to be produced and handled by centralized in-house and contract printing (38 %), by centralized data processing centers (34 %), by office machines (15 %) and by distributed forms of data processing (13%). Over twenty-one trillion pages of paper are now stored in the United States based

on studies by Frost & Sullivan (Pomerantz, 1983, p. 53). The same report claims that for each of the eighteen million U. S. office workers, there are four file drawers with 4,500 documents a piece. Furthermore, office workers are creating new documents at the rate of one million per minute. This translates to the annual creation of 4,000 new documents per office worker. At the same time this individual files ten pieces of paper each day, amounting to a daily total of 180 million pages. Within the time span of a year, this makes up 46 billion, 800 million pages. There is no doubt that paper is still the number one information-carrying medium in the world despite recent dramatic inroads of office automation systems.

When analyzing how managers tend to spend their available time gives additional understanding about the potential of integrated office automation systems. Managers in over 30 studies—too numerous to detail here—spent when averaged 38.29 percent (SD = 17.45) of their time in face-to-face settings, 10.50 percent (SD = 8.00) of their time is spent on the phone, 14.58 percent (SD = 7.73) reading and 14.57 percent (SD = 5.95) of their time is occupied by writing. Similar studies report that 46 percent of the manager's time is spent in meetings or with telephone calls, 25 percent is spent with administrative tasks, 13 percent with document creation activities and the remaining 16 percent fall into the analysis and other category. Others have reported that only seven percent of the manager's time is spent with primary functions (decision-making) and that 78 percent of available time is spent with various communication activities such as receiving, storing, filing, retrieving or transmitting information (Cf., e. g., Horwitt, 1984, p. 40). Professionals spend about 20 to 30 percent of their day just searching for information (Welson, 1979, p. 78). Secretaries spend 25 percent of their time away from their desks and about 18 percent waiting for work, i. e. they are either unavailable to those they support or just idle (Welson, 1979, p. 78). Others claim that only 20 percent of a secretary's day is spent typing. Secretaries are interrupted approximately 45 times a day (Welson, 1979, p. 79). Such data should be seen in light of the fact that the cost of dictating and transcribing the "average" letter amounts now to \$8.10, a 6.6 percent increase over the 1983 cost of \$7.60, according to the annual survey of the Dartnell Institute of Business Research ("High Cost of Communicating," 1984). It is still quite common that the majority of office tasks are not analyzed and proceduralized and, many times, when procedures exist they are either ignored or out of date. Quite frequently, people in the office perform tasks which are clearly marked for lower paid personnel as can be observed when a manager or professional stands in line waiting for the photocopying machine.

From the results of a recent study on the contents of telephone messages conducted by AT&T (Cited in Rosenberg, 1984, p. 36) we know that less than ten percent of the messages are "complete." Except for the category of "no message" calls, these phone calls will trigger at least one more call, even though it is highly probable that a complete message would have enjoyed higher productivity results. This AT&T study found that in terms of message content 46 percent left name and number, 26 percent left name, number and purpose, ten percent left their name only, nine percent left a complete message and nine percent left no message. It should be noted, however, that 82 percent of these telephone messages constitute really no more than a "call report" due to the interpersonal barriers of third-party message taking. Similar results have been reported by Hirschberg et al. (1982). Asten (1984, p. 31) estimates that U. S. business has currently a \$15 billion "pink slip problem" (for telephone messages) and that 64 percent of the many millions of return telephone calls made are actually displaceable.

Technology has been advancing manufacturing productivity for centuries, but relatively little has been accomplished for the information and services sectors of U. S. industry. These sectors constitute over 50 percent of all four labor sectors and the 'information business' accounts for 60 percent of the nation's economy (Cf., e. g., OECD, 1982; Porat, 1977). With the information and services sectors being the largest ones, it is here where labor saving methods will pay off the most. Numerous productivity-enhancing office automation technologies have already or will produce large advances in productivity. One estimates that information flows are increasing at an annual rate of ten percent and since over half of the U. S. work force is now processing information, it makes eminently sense to automate increasingly information processing and transmission functions. Otherwise, we are likely to choke on information overload as the statistics below may suggest.

It is most surprising that investments in office workers have not been considerably higher. Blue-collar productivity increased more than 80 percent during the 1960s, yet U. S. white-collar productivity increased merely four percent during the same time span (Vaughn, 1984, p. 64n). It is generally estimated that \$30,000 in start-up equipment, services, and training are required to support just one knowledge worker (Kearns, 1984a, p. 69), the term frequently used to denote managers, administrators and professionals as a group. Poppel (1982, p. 147) reports from a Booz, Allen & Hamilton study that more than \$1 trillion went for salaries and support of white-collar workers in 1982 and \$600 billion of this figure went to compensate knowledge workers. Some experts predict that by the year 2000, 119 million people—amounting to

nearly 90 percent of the U. S. work force—will be white-collar workers. By 1990 at least half of all office workers in the U. S. will use a word processor, a data processor, or some variant thereof ("Offices," 1984, p. 72). Secretaries and typists represent only 8.7 percent of total office salary costs, while professionals and managers make up 68 percent (Kearns, 1984b). It is estimated that word processing systems could eliminate 3.8 percent of all office costs if they replaced every typewriter, the savings yielded from automating professionals and managers would be substantially higher. According to Kearns (1984b), interpersonal communication, analysis and decision-making make up 47.2 percent of all office expenditures. In spite of those figures though, by early 1980, only 15 percent of major U. S. businesses reported having more than five qualified, full-time office automation professionals on their staffs (Poppel, 1982, p. 154). As the cost of automated office equipment has declined and become more accepted in the executive suite, it appears that the race is on to make white-collar workers considerably more productive.

3. Work Efficiency Due To Office Automation Efforts

A wide variety of office automation technologies are available to be used for various organizational activities. They could be classified into four phases of product preparation, i. e. input (conversion of ideas or thoughts into verbal or written communications, production (processing or manipulating ideas or thoughts created and/or stored during the input phase), output (the generation of an electronic, optical, or hard copy document) and distribution (transmission or movement of output documents or data). The tools in this sweeping electronic upheaval are the interlocking parts of a communication network that was inconceivable just a decade ago. These technologies include the following:

- Communication satellites
- Computer conferencing technology
- Computers (including personal computers, desktop workstations and terminals)
- Electronic mail
- Facsimile
- Networks
- Optical character recognition
- PBXs (telephones, including cellular and mobile telephones)

Records management technology
Teleconferencing technology
Teletex
Video disks
Videotext
Voice messaging, voice recognition and voice activated technology

The limited space here would not allow to address all known positive and negative effects for each of these technologies. In order to overcome this difficulty an effort is being made to summarize these findings for office automation settings, especially integrated office automation, as much as possible. Rice and Bair (1984, p. 189) present a broad summary of key productivity findings and benefits of office automation and grouped them into five areas:

1. Control: requiring less information to perform a task, better planning, providing a more effective response.
2. Timing: reduced waiting time for a meeting to commence or for another department to respond to an inquiry; reduced time spent in decision-making, initiating action, or responding to the environment; increase flexibility of work schedule. Uhlig et al. (1979, chapter 3) elaborate on the role of these components of a cybernetic communication system in improving productivity. The other three areas involve the form, transformation, and by-products of communication activities.
3. Automation: the replacement or elimination of manual processes, such as constant revision of mailing lists, that do not contribute to increased effectiveness. ...
4. Media transformations: time, energy, and errors in transferring information from one medium to another may be reduced. For example, a company memo may pass through many media--oral, tape, typewritten, handwritten, revision, typewritten final, photocopies, and mail--before the content is entered into someone's calendar.
5. Shadow functions: unforeseen, unpredictable, time-

consuming activities that are associated with accomplishing any task, but do not contribute to productivity, including telephone tag and unsuccessful attempts to retrieve information from a personal file. ...

These class categories are, undoubtedly, useful. On the other hand, they are at such a high level of abstraction that they are of little direct utility for the practitioner. An attempt is made to summarize key work efficiency findings for office automation settings. They are presented in Table 1. These and other studies have investigated the impact of information technology upon organizational settings. Space limitations do not permit additional elaborations on those specific results.

Insert Table 1 About Here

Table 1: Work Efficiency Impacts of Office Automation Settings

Research Reference	Work Efficiency Impact
Bair (1974)	Changes in communication patterns: decreased face-to-face contact and increased vertical communication
Bair (1980)	Reduction of telephone shadow costs
Bamford (1978, 1979)	Decreased document turnaround time and increased document output
Bullen et al. (1982)	Improved work flow with time saved
Canning (1978)	Increased volume of communications
Conrath & Bair (1974)	Reduction in telephone and face-to-face communication; increased upward communication flow
Cramer & Fast (1982)	Considerable secretarial time saved
Crawford (1982)	Decline in menial, clerical tasks
Curley & Pyburn (1982)	Greater organizational productivity when seen as more than a way to increase secretarial output
Dahl (1981)	Annual cost savings and 8% increase in knowledge worker time
Dunlop et al. (1980)	Striking productivity gains from 50-100+ percent in document preparation
Edwards (1978)	Change in working based on ability to work at home
EIU Informatics (1982)	
Rank Xerox	Large reductions in telephone use, 1 hour/day labor saved for attorneys
German Computer Services British Dept. of Education & Science	Joint information sharing and editing
England-various organizations	50-100 % productivity gains in word processing after 6 months
British travel agents	Many sites did not reach cost-justifying word processing productivity levels
Scotland	Word processing output rose 150 %
Engel et al. (1979)	Word processing output rose 150 %
	5-25 % knowledge worker and 15-35 % secretarial time saved
Gardner (1981)	Decreased turnaround time in document preparation and scheduling
Guttek (1982)	More creative, challenging, complex, organized work
Helmreich & Wimmer (1982)	High User Acceptance
Johansen et al. (1979)	It takes longer to transmit the same amount of information in electronic print form than transmitting it verbally

Table 1 (continued)

Research Reference	Work Efficiency Impact
Kalthoff & Lee (1981)	Use of micrographics system resulted in minimum of 30 % saving of annual operating costs; reduction of 90 % or more in space requirements; more rapid information retrieval (25 % to several hundred percent faster); increased file security and document integrity; substantially decreased duplication and distribution costs
Kaplan (1980)	Use of dictation equipment resulted in 6.25 to 12 % time savings per day
Kerr & Hiltz (1982)	Agreement on the group's decision tends to be lower in computer conferencing groups. When groups have longer periods, the level of agreement seems to improve in such groups.
Leduc (1979)	Changes in communication patterns: ability to work at home and increased vertical communication
Lippitt et al. (1980)	Reduction in memos and phone calls
Miller & Nichols (1981)	
Melton (1981)	Improved communication and decreased information float
Mertes (1981)	Cost and time savings via central library
National Archives and Records (1981)	Concept, scope, and potential of office automation ill-defined in government
case processing	Reduced backlogs, more timely and accurate reports
electronic messaging	Too few terminals—no benefits identified
optical character scanning	More cost-beneficial than word processing
National Bureau of Standards (1980)	Use of stand-alone display text editors resulted in an average of 75 % to 133 % productivity improvement if used for original and revision typing; average 104 % to 181 % if used for revision only
	Use of word processing impact printer (letter quality) was 148 % to 533 % faster than electric typewriters' capacity
	Use of data processing printer (matrix) was 1,184 % to 3,554 % faster than electric typewriter for a matrix, 40-120 cps printer; 4,813 % to 6,417 % faster than electric typewriter for a 150 to 2,000 lines per minute (line) data processing printer.

Table 1 - continued

Research Reference	Work Efficiency Impact
National Bureau of Standards (1980) (continued)	Use of micrographics enjoyed a 25 % savings in retrieval/access time Use of facsimile (fax)—the transmission of an 8 1/2" by 11" page took 30 sec. to 6 min.; when 6 min. compared to 2 days for mail to arrive, fax was 480 times faster
Panko & Panko (1981)	Many perceived benefits—more for managers and professionals using system directly than for secretaries; highest benefit for long-distance communications
Picot & Reichwald (1984), Picot et al. (1982)	A tension exists between a favorable attitude toward technological innovations in offices and skeptical view of the specific personal consequences to be faced when technological change in offices occurs. On the one hand, a large majority (80 %) articulates a positive opinion on new office technology; on the other hand, wide-spread fear (60 %) of unfavorable consequences for own work situation exists. Substitutability and choice of communication channels were studied
Rice & Case (1982)	Reduction in paper and telephone traffic; increased work quantity and quality; but depends on "media style"
Rice et al. (1984, p. 192)	For electronic messaging, benefits: permanent, searchable record; fewer meetings are needed; control of time to respond; independent of time zones and geography; quick delivery; easy to distribute widely; speedy response; upward communication is encouraged; can serve as channel substitute; potential for reduction in travel; medium for creation, transmission and receipt of message are the same; fewer nonverbal constraints; - drawbacks: potential for information overload, misunderstandings can occur, people may be inhibited by machine, much useless information can be distributed due to ease of use
Rice et al. (1984, pp. 137-140)	As compared to computer conferencing, it takes less time to arrive at a decision in face-to-face groups. When the studies had time limits, this fact also takes the form of less consensus because the computer conferencing groups have had less effective time in which to consider the problem.

Table 1 - continued

Research Reference	Work Efficiency Impact
Steinfield (1983)	More timely and accurate information, increased coordination
Steward (1983)	13 % daily time saving; 35 % increased document output
Talbot et al. (1982)	Less time in communication activities
Tapscott (1982)	Changes in communication patterns: decreased telephone usage and meetings
Tucker (1982)	Implementation failure primarily due to shortened initial analyses phase
Uhlig et al. (1979)	Reduction of telephone shadow costs
Witte (1980, 1977)	By means of new communication technologies, decentralized autonomous groups could pursue their work effectively without risking organizational disintegration
Witte (1976), Szyperski (1979)	New structural configurations for innovative organizational decision-making could emerge
Yankee Group (1978)	Use of electronic mail resulted in a 40 % reduction in dissemination time
Zouks (Cited in "Computers Rescue," 1980)	Use of personal (professional) terminal resulted in 50 % productivity rise

Note: Some of the above references and impacts were first compiled by Rice and Bair (1984, pp. 211-213). Due to space limitations only the newly added research references are cited in the reference section.

Goldfield (1985, p. 66) classifies work efficiency and office productivity studies according to the nature of the issues involved and the associated problems by organizational layer, as represented in Table 2.

Table 2: Classification of Work Efficiency and Office Productivity Studies

Organizational Layer	Description	Problems
Top Executives	Most expensive, greatest contribution Conceptual thinkers Decisions critical for strategy	Highest taboo area
Managers	High salaries Control of Operations Decisions critical for implementation	Difficult to identify need Tasks varied Stiff resistance to automation
Professionals	New target group Technical skills	Qualification critical, difficult Task specialized
Support Staff	Easiest to quantify and cost justify Most frequently automated	Often least significant savings opportunity

Of particular concern to those interested in integrated office automation systems are various structural changes and changes that can occur with organizational power that are due to the introduction of newer information technologies.

4. Squeezing the 'Organizational Sponge': Structural Changes Due To Information Technology

The computer has changed the office environment just like the automobile has changed the city. Integrated office automation is a revolutionary development in the transfer and general dissemination of information and data. It clearly has the power to shake an organization from the top to its very foundation. An effective integrated office automation system may result in the restructuring of one or several organizational units ranging from minor adjustments to the eradication of a unit.

Several authors have argued that new structural configurations could emerge within organizations employing newer information technologies (Wynne & Otway, 1983; Witte, 1980, 1977; Szyperski, 1979). Already as far back as 1958, Leavitt and Whisler predicted that the design of large-scale hierarchies will be changed from a pyramid toward a bell formation in line with changing distributions of power and authority within the organization. Most organizations enjoyed a relatively rapid growth since World War II and with such growth, middle management grew even faster. In the 1970s, the U. S. economy absorbed a rapidly expanding labor force and created 19 million new jobs, whereas most western European nations' economies were at a standstill or suffered declines in the post-OPEC era. In effect, the nation had put the Baby Boom generation, born in the 1940s and 1950s, to work and these Baby Boomers are now reaching middle age. Working women at an age of 35 and older have been instrumental in allowing business to expand since World War II. Women have seized two-thirds of the more than 20 million jobs created in the past decade, accelerating the shift from manufacturing to services ("Women at Work," 1985, p. 80). Middle management together with professionals and technical people constituted the fastest growing sector in the occupational groups in the last 30 years.

Typically middle management was to take policy decisions received from top management and translate them into profitable revenues. Staff-level middle management was expected to advise their superiors on marketing, strategic planning, manufacturing and engineering issues. At an increasing pace middle managers became the collectors of information that they in turn analyzed, interpreted and then moved along to top executives. From these type of activities the middle manager came to dominate line operations. During the last few years, however, it appears that the function of middle management has changed and that much of this change is due to recently introduced information technology ("Communications Is Dealing," 1983; "Computer Shock," 1983; "A New

Era," 1983; "Office Automation Restructures," 1984; Walton & Vittori, 1983). This technology is rapidly reorganizing the kind of work people do and, at the same time, reorganizing our organizations as well. New patterns of communication and interaction become possible and, as a consequence, our established communication networks within organizations change (cf., e. g., Picot et al., 1982). The newer information technologies make it possible that a greater amount of information is made available to more and more people in an increasingly timely manner. Such changes, no doubt, can influence decision-making patterns and can result in organizational power plays.

Rather recently, at least since 1982, the middle manager's role was turned upside down. Middle management has been reduced in significance and numbers because its basic function of communication has—at least in part—been assumed by machines. The vast in-roads made by the newer information technologies appear to have restructured the average organization's middle ranks and, as a consequence, they have shrunk drastically. Maybe the first results of this radical phenomenon could be observed after the most recent recession in that many laid-off middle managers—until recently a rather stable and secure position within the organizational hierarchy, earning anywhere between \$25,000 to \$80,000—were not rehired.

Frequently, top executives viewed middle management as an organizational sponge sitting solidly in the middle of the organizational pyramid. If one pushed the elastic sponge a little bit from above or below, not much happened. But if one tried harder and squeezed the sponge some action occurred, although—just as with real-life sponges—once the pressure subsided, sponges have a tendency to assume their old shape, size and volume. Now—it appears—new means have arrived to deal with this phenomenon.

As more and more top executives recognize that much of the information previously collected by middle managers can be secured quicker, cheaper and more thoroughly by computer-based devices, they have started to view much of the middle management layer as redundant. Many now view these information gathering, analyzing and interpreting tasks traditionally carried out by middle managers as considerable cost centers, high in overhead and making relatively small, directly-attributable contributions to profits. They are realizing in accordance with their Japanese competitors that less means more. Many bureaucratic functions can be replaced by information technology. In addition, since much interaction between a manager and his/her subordinates can be carried out nonsimultaneously via electronic media, a manager can take on direct responsibility over several more individuals. This, of course,

could result in fewer managers at the intermediate level, but it might imply additional positions at the remaining levels. Jennings (cited in "A New Era," 1983) claims that one-third of the 100 largest industrial companies are reducing management and that there are clear signs that other corporations will follow. Analogously, during the first quarter of 1983 the U. S. Bureau of Labor Statistics reported that unemployment among managers and administrators in non-farm industries was the highest since World War II. The latter report did not even include those managers who took advantage of early retirement programs and similar incentives.

Even old-line companies have made cuts in their middle-management staffs: Firestone and Crown Zellerbach, e. g., cut their middle-management staff 20 percent, Chrysler did the same with 40 percent ("A New Era," 1983, p. 52). Similarly, a few leading edge companies have reported significant structural changes due to new information technology: The chairman of Hercules, Inc. cut the levels of management between himself and Hercules plant foremen from a dozen to six or seven. FMC Corporation reports its amalgamation of sales districts and, in many cases, cut out a level of management. FMC installed a voice-mail system and the resulting reduction in cost for long-distance calling alone paid for the voice-mail system. Citicorp introduced a sophisticated information system to improve customer service and make account and market information available to its corporate clients more quickly. This step allowed Citicorp to reduce its staff—70 percent of whom were formerly clerical—from 2,650 three years ago to 2,150. This bank has now been able to move its customer service operation closer to its clients since information can now be transmitted electronically. More than 90 percent of its employees were based in New York in 1979 vs. only 50 percent today. ("Office Automation," 1984, p. 118). Similarly, General Electric laid off eight percent of its white-collar work force in November 1984 at its vast Appliance Park Complex in Louisville and GTE Corporation, whose total payroll has fallen to 183,000 from 200,000 in the past two-and-onehalf years, has been cutting layers of management and combining jobs to boost white-collar productivity ("White-collar jobs ...," 1984)

It has been estimated that by the year 2000, computerization will have caused only a moderate reduction in total jobs. The likely losers, however, are expected to be white-collar clerical and managerial positions. Clerical jobs are said to decline from 17.8 percent of the work force (in 1978) to 11.5 percent in 2000. Although there will be major growth in the professional sector, the need for managers will fall off (Leontief, 1985).

Together with economic necessity and technological forces it appears that middle management is affected by such developments in a number of ways. The corporate structure tends to be changing in that broader information gathering can be accommodated and that data can flow to top executives and managers directly without the editing, monitoring, interpreting carried out by middle managers. Many times, the analysis of such activities provide an opportunity to examine what workers actually do. A redesigned organization is likely to pull together and merge under just one organizational umbrella department such units as office automation, management information systems (MIS), data processing, word processing and telecommunications. These efforts may result in the creation of a new group of information managers. They, in turn, would be responsible for the use and protection of valuable data and, in a sense, they would become the custodian of organizational information. Information centers, as such newly created organizations are called, are growing at a rapid rate. Of 160 large North American corporations questioned in mid-1984 by the Diebold Group Inc., 80 percent stated that they had set up information centers this year (up from 67 percent in 1983) ("Office Automation," 1984, p. 124). Numerous industry experts predict that end-user computing is going to be the dominating means of providing information support and will result gradually in a major organizational change.

As a result of these changes, the management pyramid has begun to flatten with fewer levels and, as a consequence, employees make more lateral moves and their expectations tend to be lowered since fewer organizational layers means fewer chances for promotion. Any changes in the organizational structure are today largely perceived as a by-product of the new information technologies. Eventually the structure of departments and divisions will change as they increasingly share information for operations and decision-making. One data base, e. g., may support several departments and others could be merged and integrated to make full use of relational data base features. These trends may suggest that middle management positions become less secure and more competitive. Furthermore, organizational structures will experience a gradual shift from the typical pyramid to a shape resembling a diamond. The clerical function is likely to be distributed organization-wide.

5. A New Organizational Power

The effect of automation on organizational power can be observed in a number of ways (Wynne & Otway, 1983). As more and more timely information

becomes available to a larger number of people, this increased availability of information can result in changes in the decision-making patterns and power bases of organizations. Organizational power can be defined as the ability to exert influence and bring about desired outcomes, including (1) the ability to resolve uncertainty and solve problems, (2) the power of expertise and (3) diminishing job specialization (Cf., e. g., Collier, 1984, p. 34; Steers, 1984, pp. 306-328; Pfeffer, 1981, pp. 2-3). With the newer information technologies available in organizations, political power associated with the control of information becomes more and more distributed in most organizations. Some, however, experience the opposite for certain technologies, i. e. control can become more centralized. Access to information via these new technologies makes greater centralization of power and control in organizations possible, since top management is enabled to make decisions quicker and by themselves that would otherwise have to be delegated.

Routine activities can also be related to decision-making power (Collier, 1984). Task routinization reduces uncertainty in a job and, in turn, provides an avenue to reduce uncertainty for someone carrying out this task. Furthermore, task routinization makes possible the reduction of unknown entities, reduces the complexity of the task at hand, requires fewer skills and makes those executing the task more replaceable. It follows then that those who carry out routinized tasks have less power with limited or no decision-making authority in their work environment. These are usually also the reasons why employees may resist office automation efforts. In part depending on the structure of the task and the degree of required specialization, a secretary may, e. g., resist a change to word processing when this individual was accustomed to performing variable tasks.

Frequently, the strongest resisters when a new technology or procedure is introduced are almost always the middle managers. There are good reasons for this though: they equate their power with the number of people they supervise and anything that changes this is likely to threaten them. They are often left out of direct involvement with the new technology and, as a consequence, they do not experience the direct benefits themselves. Usually they have been promoted because they understand the current procedures better than their subordinates. Kearns (1984a, p. 70) claims that "The trouble with a lot of white-collar people is that they think the reason they are employed is that they are experts."

On the other hand, the newer information technology can strengthen the power of individuals or entire organizational units. In part depending on how

the equipment is utilized, individuals or units could be perceived as being irreplaceable which always was viewed as an important source of power. Some individuals or units may be able to use information technologies while others are not or have not yet received such technology. Until the technology becomes widely available as a resource, the parties involved can enjoy a certain degree of leverage or power due to the access to and control of the technology.

Such information technology makes it possible for individuals or units to carry out many more tasks. As a result, the degree of specialization is reduced in many organizations and individuals or units can take on additional responsibilities which may imply a loss or possibly an increase of organization power. Furthermore, such developments are likely to make organizational units more interdependent with others which can be accommodated more easily and can make increased information exchange and sharing possible due to the available information technology. Overall, as specialization is reduced, this should have positive results on various organizational conflict situations and power struggles since information is now largely distributed as opposed to being available to only certain individuals or units. It will be more and more difficult to control absolute, i. e. undistributed, information when on-line information systems and joint databases are used.

6. Conclusion

As organization charts are redesigned, as chains of command are simplified and as the new structures are implemented, the balance of power is changing and shifting in our organizations largely as a result to information technology. Rigid, hierarchical structures are redesigned resulting in leaner, more flexible and responsive organizations with fewer management levels and more direct information exchange between the top and bottom layer of the organization. Organizations are creating environments in which performance determines compensation and a relative high degree of freedom to improve performance becomes the psychological reward.

The phenomenon described here may be observable only in a few large organizations so far, but it is expected to hit many more within the next few years as they automate their offices. This trend can be seen as an evolutionary step toward more flexible, decentralized and less defined structures, resulting in a fluid organizational structure whose design is

based on the changing needs of the organization. IBM, e. g., is one organization that has long had this type of organization in place. Organizational structures serve both to differentiate and the integrate the components of complex organizations. Organizations do not achieve and maintain effectiveness by technology alone. Studies have shown that the effectiveness of an organization is contingent upon the degree of fit it achieves between the technology and its structural design. Since organizations are not things, but people, it is ultimately people who will be changed by the impact of information technologies. As organizational structures change, the distribution of power will change as well. This problem is unquestionably organizational and cultural within its respective setting. Deal and Kennedy (1982) predict the arrival of the "atomized organization," meaning that telecommunication networks and common culture, i. e. not the organization chart, will link the "atoms." It seems that ways must be found that improve the flow of information to the right people and to produce true entrepreneurial opportunities for managers who want such opportunities within their organizational framework. This implies that integrated information technology must be applied creatively to change the way organizations carry out their activities and use this technology to their own competitive advantage. In most organizations the technical experts responsible for managing information systems have tended to treat office administration less as a strategic weapon to win a competitive advantage and more as a productivity tool to improve the performance of clerical and managerial workers. They have viewed office automation products as simply a means to computerize old procedures. Executives must analyze how they can use new information technologies to help restructure the organization and and pare down unnecessary organizational layers. The question to ask is, 'How would I change my organization to make it more effective with information technology?' rather than, 'How can I use office automation procedures to make my employees more productive?' In the past, many managers merely focused on making individuals more productive by overlaying electronic systems (e. g., word processors, personal computers, EDP) onto the existing bureaucracy. Before we can address the issue of integrated office systems, however, we must come to realize that an integrated system requires integrated management. An organization must first evaluate its structure, for the lack of integrated management will continue to affect the success of an integrated system after its installation. Organizations should not expect long-term gains when they understand the technology, but they do not understand themselves. Integrated information technology systems applied in this suggested way are likely to turn out to be the single most important opportunity for private and public sector organizations until 1990.

References

- Asten, R. J. Integrating communications in the automated office. The Office, June, 1984, pp. 26, 31, 66, 68, 73.
- Collier, S. D. The effect of office automation on organizational power. The Office, 1984, 99(2), 34, 36, 44.
- Communications is dealing business a potent new hand. Business Week, October 24, 1983, pp. 131-132.
- Computers rescue for travel agents. Business Week, April 7, 1980, pp. 81-82.
- Computer shock hits the office. Business Week, August 8, 1983, pp. 46-49, 52-53.
- Deal, T. E., & Kennedy, A. A. Corporate Cultures. Reading, MA: Addison-Wesley, 1982.
- Goldfield, P. J. Aiming OA towards the top. Modern Office Technology, 1985, 30(2), 55-57, 60, 62, 64, 66, 68.
- High cost of communicating is getting higher. Modern Office Technology, October, 1984, p. 22.
- Hirschberg, L.; Bossaller, B.; Kerns, P.; Dugan, D.; Sargent, L.; Feltman, C.; Wiseman, S. & Dutton, W. The Notice Market: A Comparative Analysis of Electronic Message Systems. Los Angeles: University of Southern California, Annenberg School of Communications, 1982.
- Horwitt, E. Confronting the communications quandry. Business Computer Systems, 1984, 3(9), 38-41, 44, 45.
- Johansen, R. Teleconferencing and beyond: Communications in the office of the future. New York: McGraw-Hill, 1984.
- Kaplan, H. M. Words, June-July, 1980, pp. 40-43. Cited in National Bureau of Standards, U. S. Department of Commerce, Computer science and technology: Guidance on requirements analysis for office automation systems. (NBS Special Publication 500-72. (C # 80-600179). Washington, DC: Superintendent of Documents, U. S. Government Printing Office, 1980, p. E5.
- Kearns, D. T. Computers won't make a bad business good. Management Technology, 1984a, 1(12), 69-70.
- Kearns, I. S. Cited in: "Office automation restructures business," Business Week, October 8, 1984b, pp. 124-125.
- Leavitt, H. J., & Whisler, T. L. Management in the 1980s. Harvard Business Review, 1958, 36, 41-48.
- Leontief, W. Cited in, "Automation's impact on employment," Boardroom Reports, February 15, 1985, p. 9.
- Lewis, M. Computer crime: Theft in bits and bytes. Nation's Business, 1985, 73(1), 57-58.
- McArthur, D. W. The integrated office: Its present and future. Telecommunications, 1984, 18(9), 57-58, 90.
- Memo—A news digest for managers. Office Administration and Automation, 1984, 45(7), 22.
- National Bureau of Standards. U. S. Department of Commerce. Computer science and technology: Guidance on requirements analysis for office automation systems. (NBS Special Publication 500-72. C # 80-600179.) Washington, DC: Superintendent of Documents, U. S. Government Printing Office, 1980.
- A new era for management. Business Week, April 25, 1983, pp. 50-56, 60-61, 64, 68-70, 74-76, 80.

- OECD (Organization for Economic Cooperation and Development). Information activities, electronics and telecommunications technologies: Impact on employment, growth and trade, p. 29. Cited in The Futurist, December, 1982, p. 37.
- Office automation restructures business. Business Week, October 8, 1984, pp. 118-121, 124-126, 130, 134, 138, 142.
- Offices of the future. Newsweek, May 14, 1984, pp. 72-75.
- Pfeffer, J. Power in organizations. Marshfield, MA: Pitman, 1981, pp. 2-4.
- Picot, A., Klingenberg, H., & Kränzle, H.-P. Office technology: A report on attitudes and channel selection from field studies in Germany. In M. Burgoon (ed.), Communication Yearbook 6. Beverly Hills, CA: SAGE, 1982, pp. 674-692.
- Picot, A. & Reichwald, R. Office communication by new text media. Manuscript submitted for publication, 1984.
- Pomerantz, D. Managing information in the eighties. Today's Office, 1983, 17(9), 53-56.
- Poppel, H. L. Who needs the office of the future? Harvard Business Review, 1982, 60(6), 146-155.
- Porat, M. U. The information economy: Definition and measurement. Washington, DC: U. S. Department of Commerce, OT Special Publication, 77-12 (1), May, 1977.
- Rice, R. E. & associates (Eds.). The new media: Communication, research, and technology. Beverly Hills, CA: SAGE, 1984.
- Rice, R. E. & Bair, J. H. New organizational media and productivity. In R. E. Rice and associates (Eds.), The new media: Communication, research, and technology. Beverly Hills, CA: SAGE, 1984, pp. 185-215.
- Rosenberg, A. M. Telemessaging answers the phone. Communication Age, 1984, 1(7), 30-33, 36-37.
- Spero, J. E. Barriers to international information flows. Telecommunications, 1983, 17(11), 67-69.
- Steers, R. M. Introduction to organizational behavior. Glenview, IL: Scott, Foresman, 1984.
- Surviving the paper tide: Xerox integrates information management. A study conducted by Xerox Corporation. El Segundo, CA: Xerox, no date, but circulated in 1984.
- Szyperski, N. Computer-conferencing—Einsatzformen und organisatorische Auswirkungen. In O. Grön & J. Rössl (Eds.), Computer-gestützte Textverarbeitung. Munich: R. Oldenbourg, 1979.
- Uhlig, R., Farber, D. & Bair, J. The office of the future: Communications and computers. New York: North-Holland, 1979.
- Valle, J. Computer message systems. New York: McGraw-Hill, 1984.
- Vaughn, J. Here comes the mailroom! Telecommunications, 1984, 18(9), 64n-64p.
- Vernon, R. E. The ideal integrated office. Today's Office, 1984, 19(2), 27-28.
- Walton, R. E. & Vittori, W. New information technology: Organizational problem or opportunity? Office: Technology and people, 1983, 1, 249-273.
- Welson, L. F. An evolutionary move to the office of the future. Infosystems, 1979, 6, 78-80.
- What next? A world of communication wonders. U. S. News & World Report, April 9, 1984, pp. 59-62.
- White-collar jobs: A hot market cools. Business Week, 1984, 2872, 40-41.
- Witte, E. Die Bedeutung neuer Kommunikationssysteme für die Willensbildung

- im Unternehmen. In A. Alback & D. Sadowski (Eds.), Die Bedeutung gesellschaftlicher Veränderungen für Willensbildung in Unternehmen. Schriften des Vereins für Sozialpolitik, Neue Folge, Bd. 88. Berlin: Duncker & Humblot, 1976.
- Witte, E. Kommunikationstechnologie. In E. Grochla (Ed.), Handwörterbuch der Organisation. Stuttgart: C. E. Poeschel, 1980.
- Witte, E. Organisatorische Wirkungen neuer Kommunikationssysteme. Zeitschrift für Organisation, 1977, 46, 361-367.
- Women at work. Business Week, 1985, 2878, 80-85.
- Wynne, B. & Otway, H. J. Information technology, power and managers. Office: Technology and people, 1983, 2, 43-56.
- The Yankee Group. Report on electronic mail. Boston, MA: The Yankee Group, 1978.